TS78 - MEASURING PERFORMANCE

12286 Automated Traffic Signal Performance Measures – A Simplified Alternative Architecture

Mark Taylor, P.E., PTOE
Traffic Signal Operations Engineer
Utah Department of Transportation, USA
marktaylor@utah.gov

UDOT udot.utah.gov

AASHTO Innovation Initiative

Opportunity – UDOT Executive Leaders - 2011

"What would it take for UDOT's traffic signals to be World-Class?

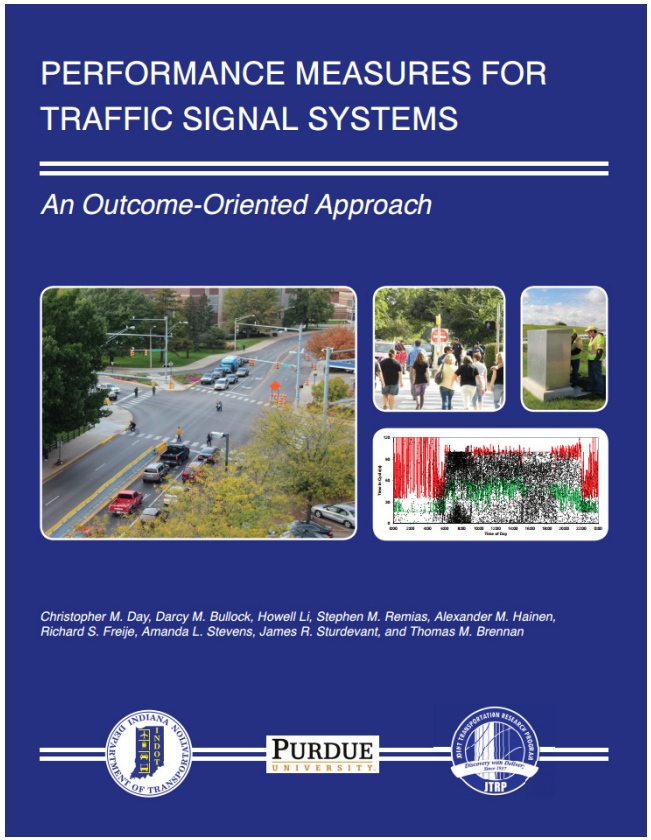
John Njord

Carlos Braceras

QIT Recommendations (July 2011)

- Require that communications and signal detection be maintained during projects.
- Transition from reactive to proactive signal maintenance by increasing signal maintenance funding.
- **Implement real-time monitoring of system health and quality of operations.**
  - Automated Traffic Signal Performance Measures (SPM's)

Beginning of SPM's for UDOT



JOINT TRANSPORTATION RESEARCH PROGRAM
Discovery with Delivery
Since 1937
JTRP

PURDUE
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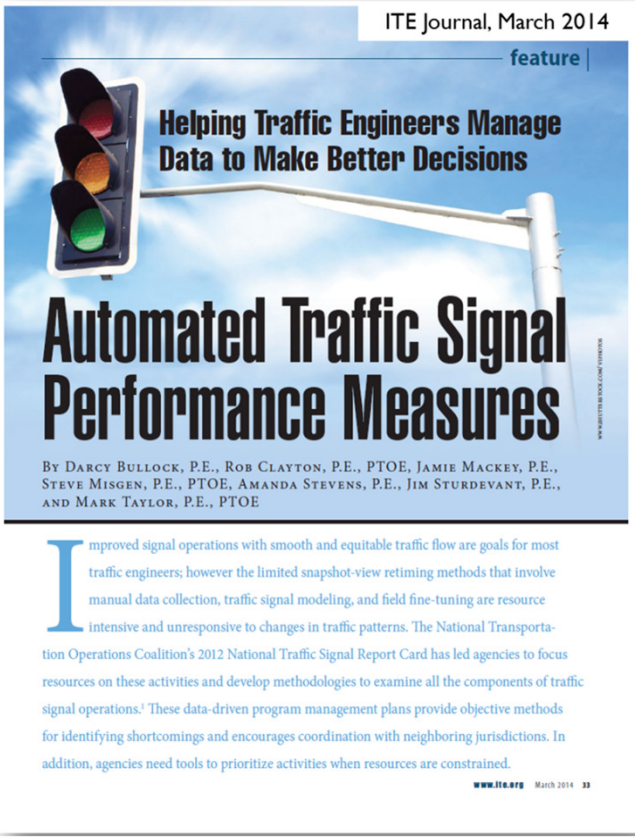
INDIANA DEPARTMENT OF TRANSPORTATION
INDOT

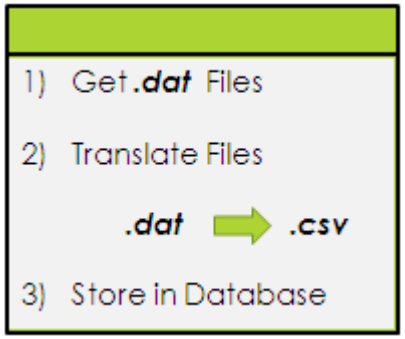


SPM's –Requirements & How it Works

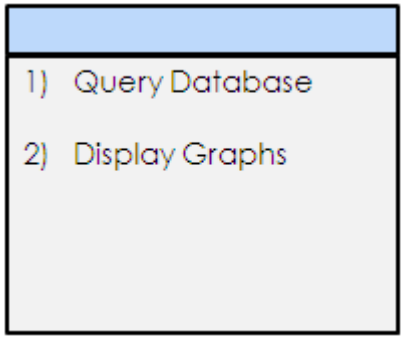
- Econolite Cobalt: Any Version
- Econolite ASC3 NEMA: V. 2.50+ & OS 1.14.03+
- Econolite 2070 with 1C CPU Module: V. 32.50+
- Intelight Maxtime: V. 1.7.0+
- Peek ATC Greenwave 03.05.0528+
- Trafficware 980ATC V. 76.10+
- Siemens M50 Linux & M60 ATC
  - ECOM V. 3.52+
  - NTCIP V. 4.53+

1) High-resolution Controller

2) Communications



3) Server

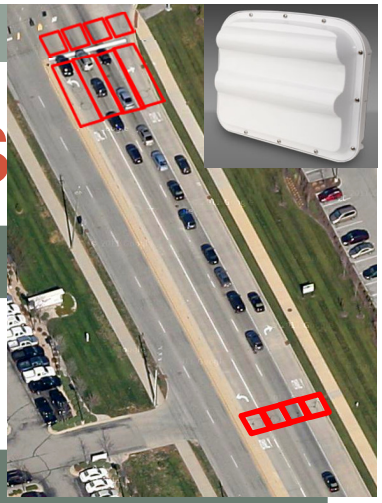


4) Website

5) Detection

Can be done independent of a Central System!

Metrics & Detection Requirements



Controller high-resolution data only

Purdue Phase Termination
Split Monitor

Advanced Count Detection (~400 ft behind stop bar)

Purdue Coordination Diagram
Executive Summary Reports

Arrivals on Red
Approach Delay

Approach Volume
Link Pivot (future)

Advanced Detection with Speed

Approach Speed

Lane-by-lane Presence Detection

Purdue Split Failure (future)

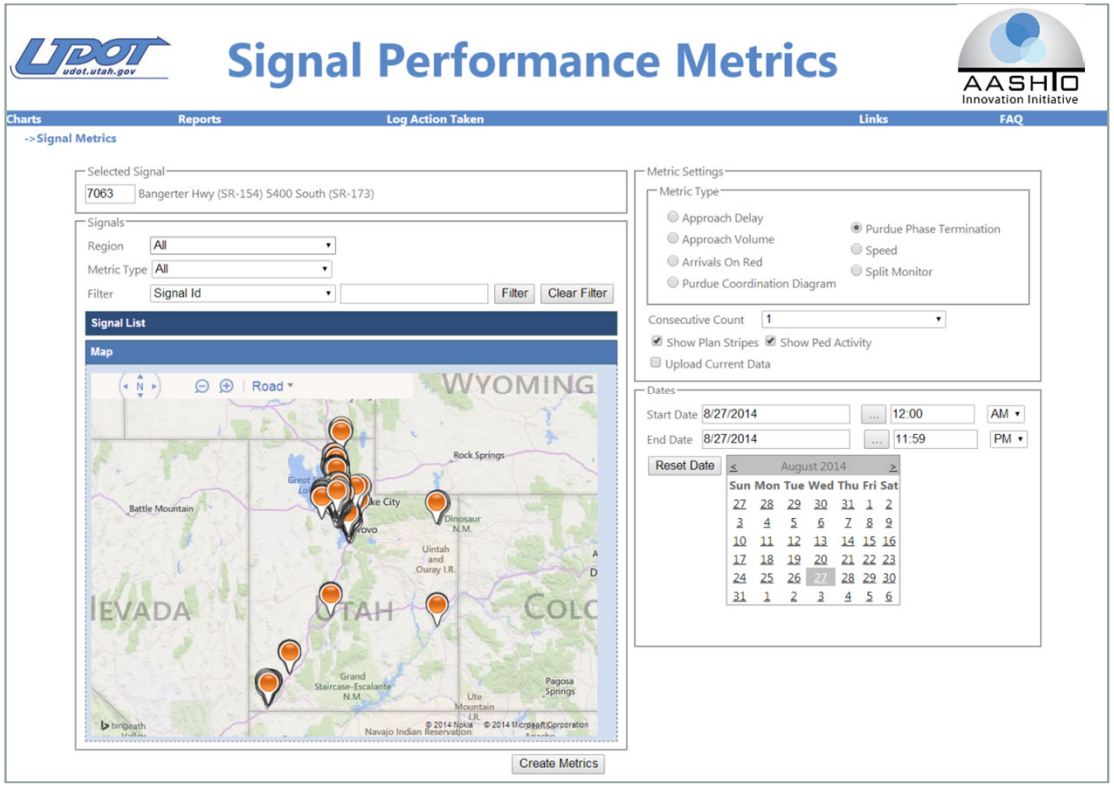
Lane-by-Lane Count Detection

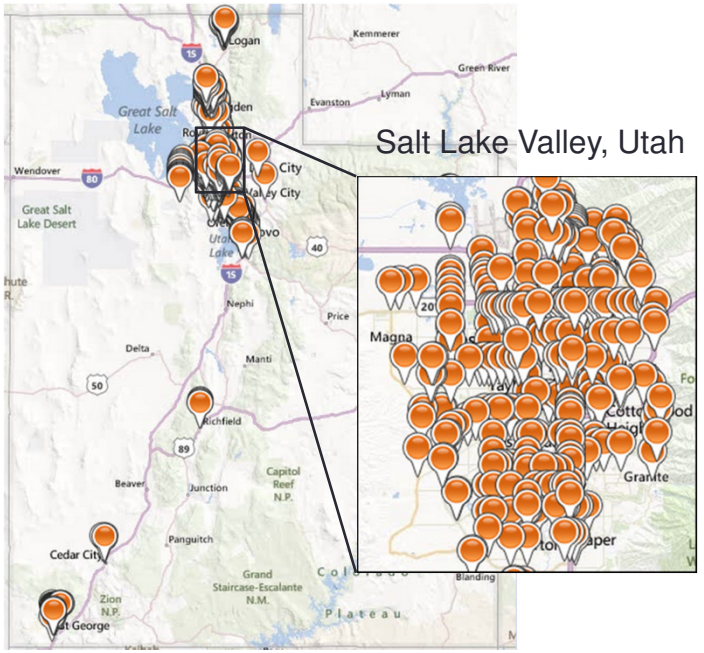
Turning Movement Counts
Red Light Monitoring (future)

Probe Travel Time Data (GPS or Bluetooth)

Purdue Travel Time Diagram

UDOT's SPM Website – Available to All





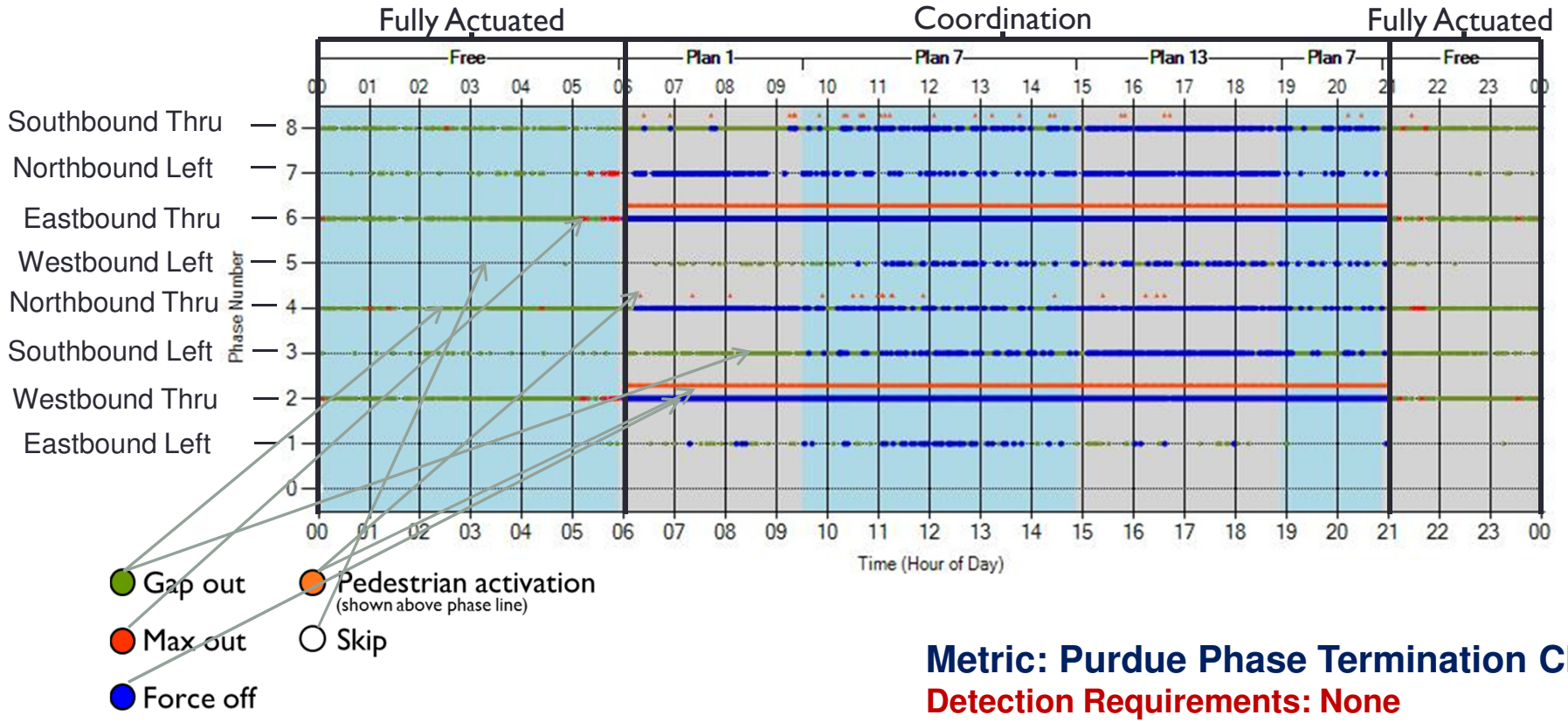
Salt Lake Valley, Utah

1250 of 1900 Utah Traffic Signals

http://udottraffic.utah.gov/signalperformancemetrics

Normal Intersection Example:

8-phase signal with working detection



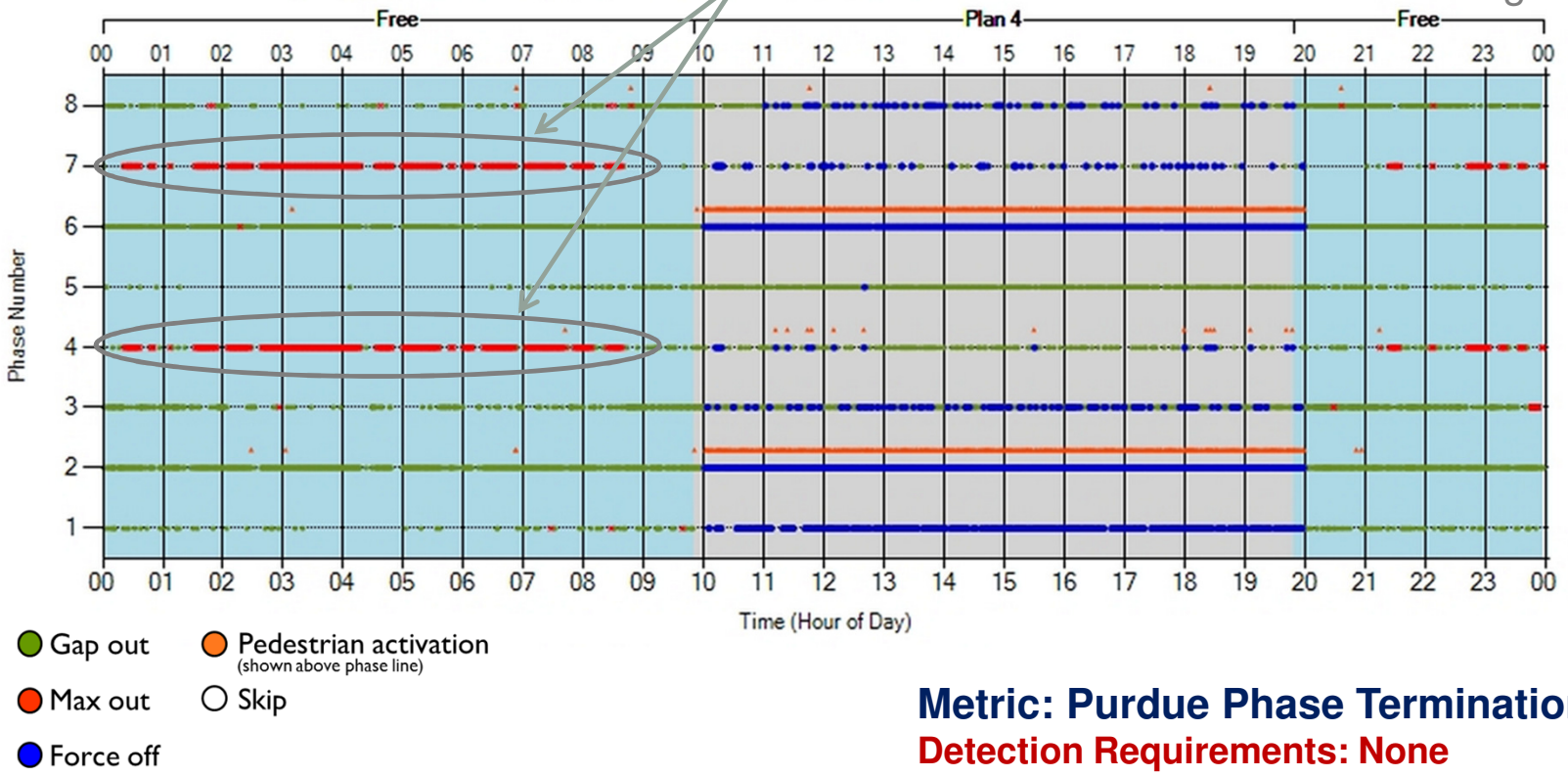
Metric: Purdue Phase Termination Chart

Detection Requirements: None

Maintenance Example:

Nighttime Detection Problem (Before)

Minor street thru & left turn max out at night only



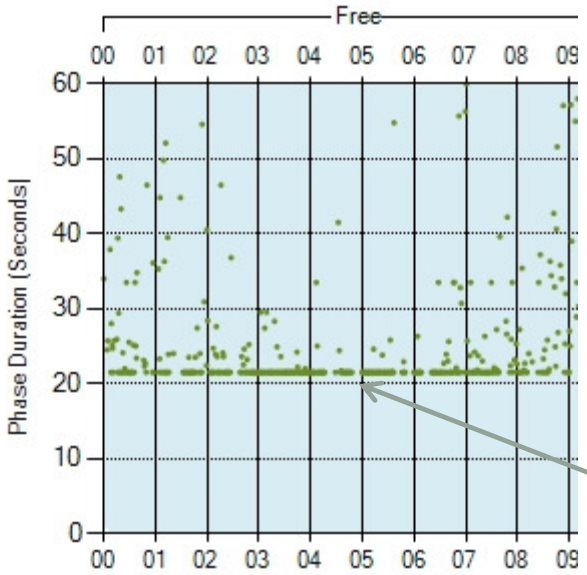
Metric: Purdue Phase Termination Chart

Detection Requirements: None

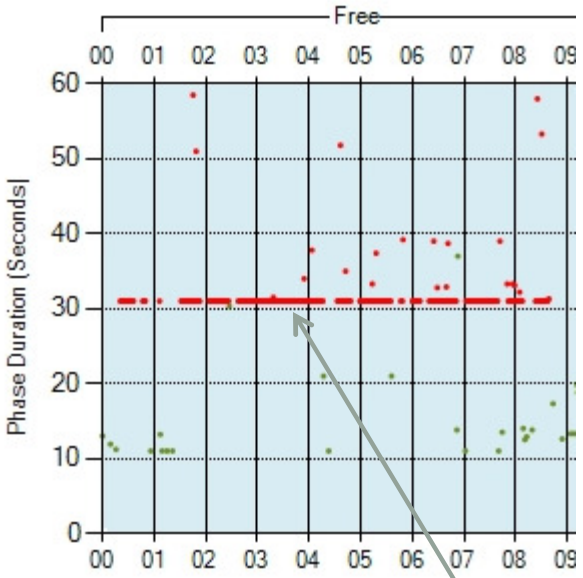
Maintenance Example:

Nighttime Detection Problem (Before)

Major Street (Ø2)



Minor Street (Ø4)



Gap out
Max out
Force off
Pedestrian activation (shown above phase line)
Skip

Major Street sees 20 s of green and 30 s of red

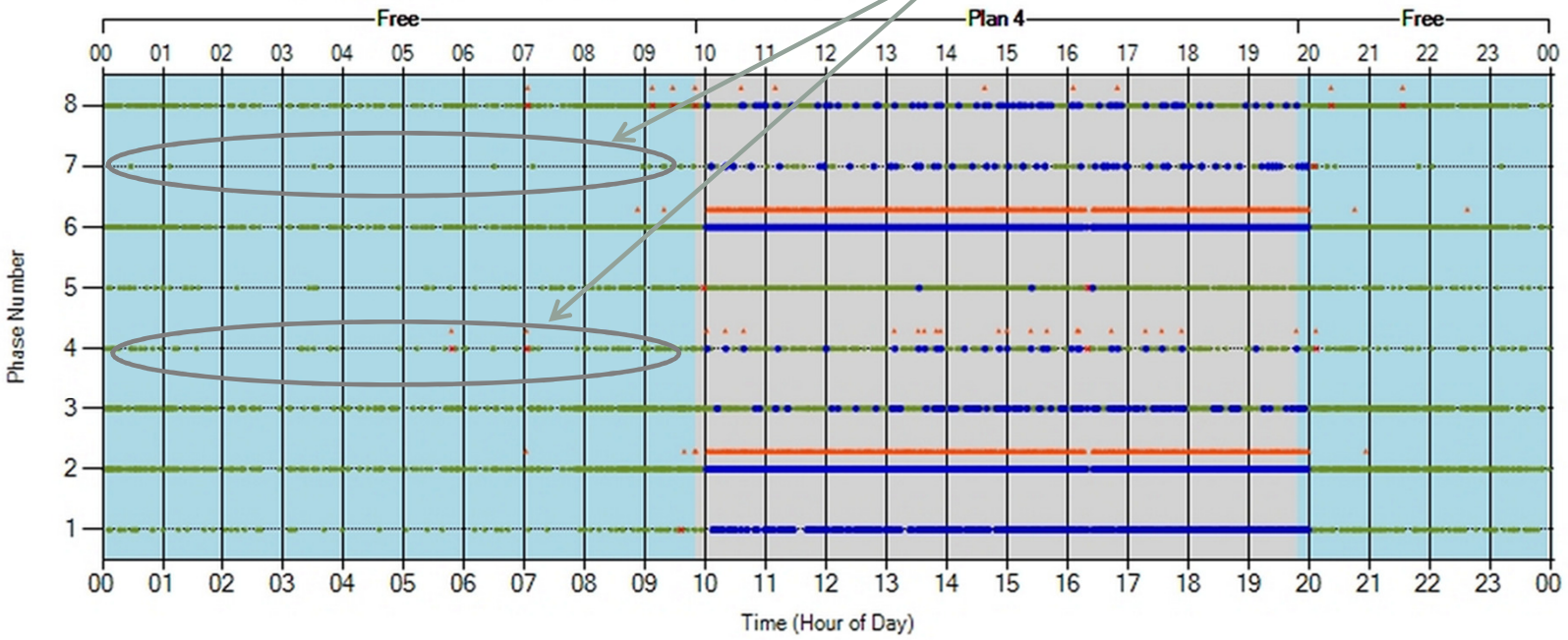
Metric: Split Monitor

Detection Requirements: None

Maintenance Example:

New Detection Technology Installed (After)

Phases are rarely used at night

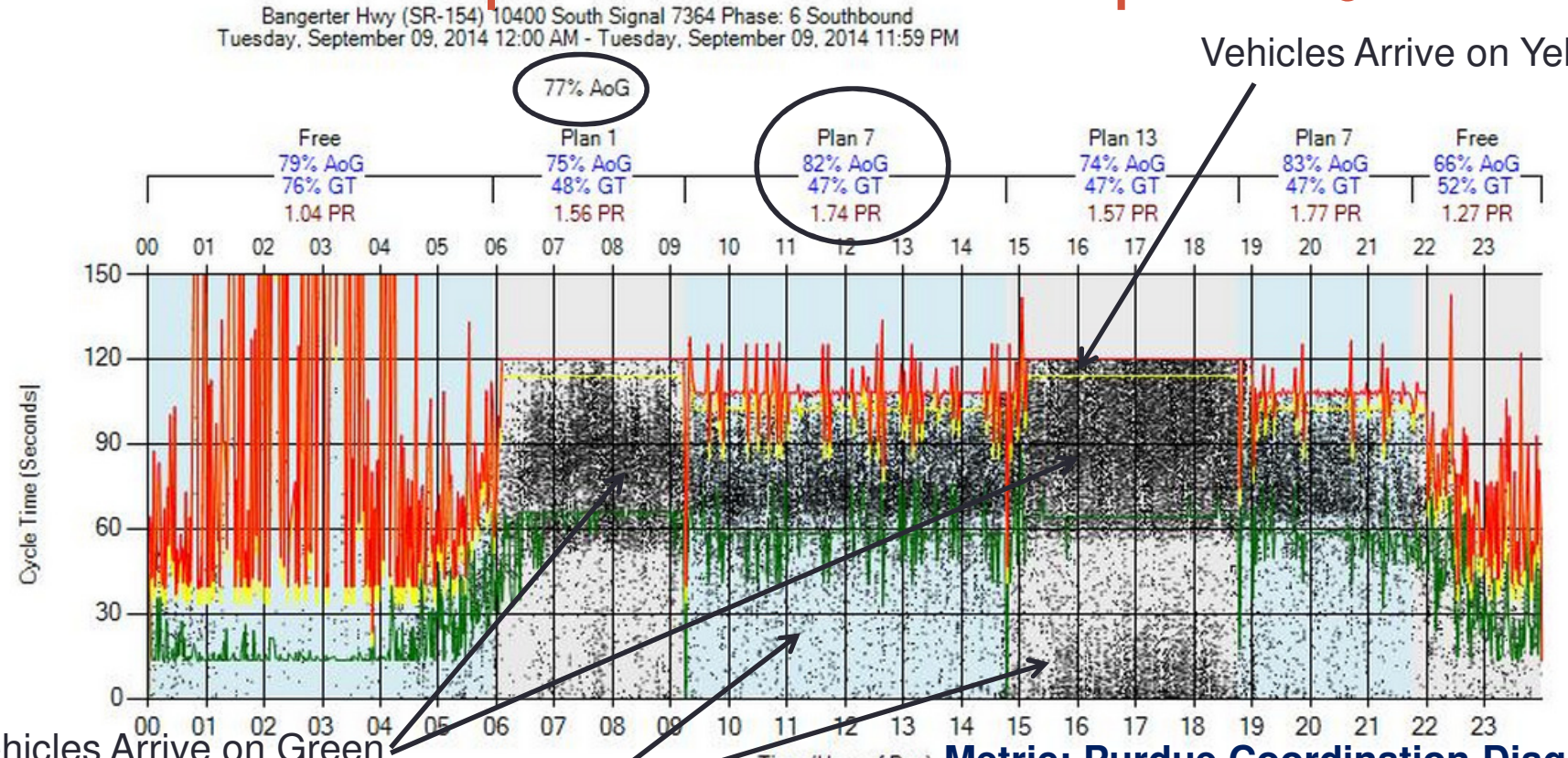


Gap out
Pedestrian activation (shown above phase line)
Max out
Skip
Force off

Metric: Purdue Phase Termination Chart

Detection Requirements: None

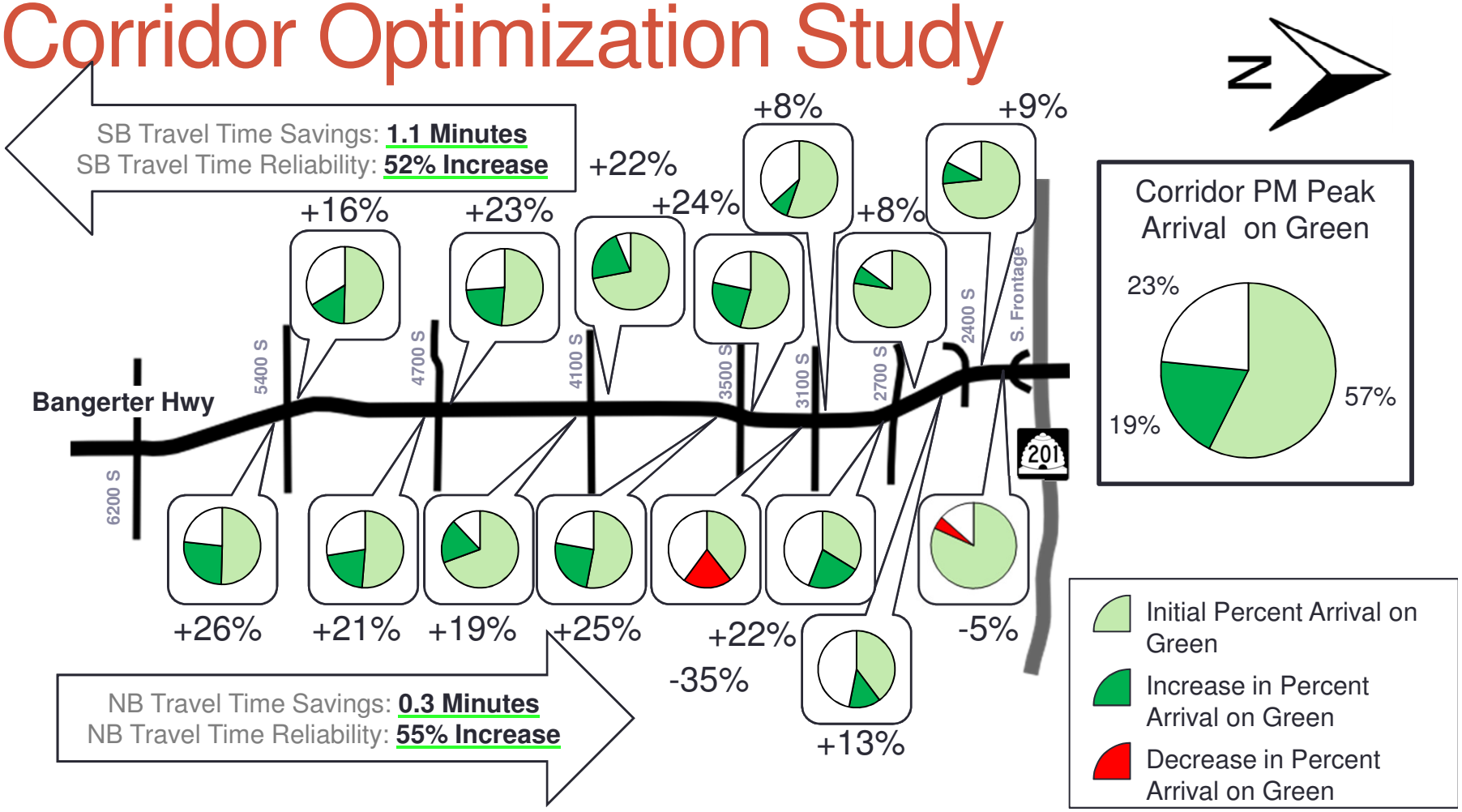
Coordination Optimization Example: Progression Quality



Metric: Purdue Coordination Diagram

Detection Requirements: Advance Counters

Corridor Optimization Study



Executive Reports & Prioritizing:

Statewide Summary 24 hours / day In Utah, USA

Month	Arrival on Red		Volume	Intersections	
Month	Percent	Platoon Ratio	Daily Average Per Approach	Total	Number of Approaches
Aug 2014	30%	1.16	10,740	414	843

- Region, corridor, and intersection summaries also available.
  - Prioritize coordination projects where they're needed the most.
- Software project to breakdown by time-of-day instead of 24/7.
- Engineers could now **directly measure** what previously they could only **estimate and model**.

Metric: Executive Reports
Detection Requirements: Advance Counters

Automated Traffic Signal Performance Measures

AASHTO Innovation Initiative (formally TIG)
2013 Focus Technology

Mission: Investing time and money to accelerate technology adoption by agencies nationwide

Thank You!

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Controllers with Indiana Datalogger Enumerations

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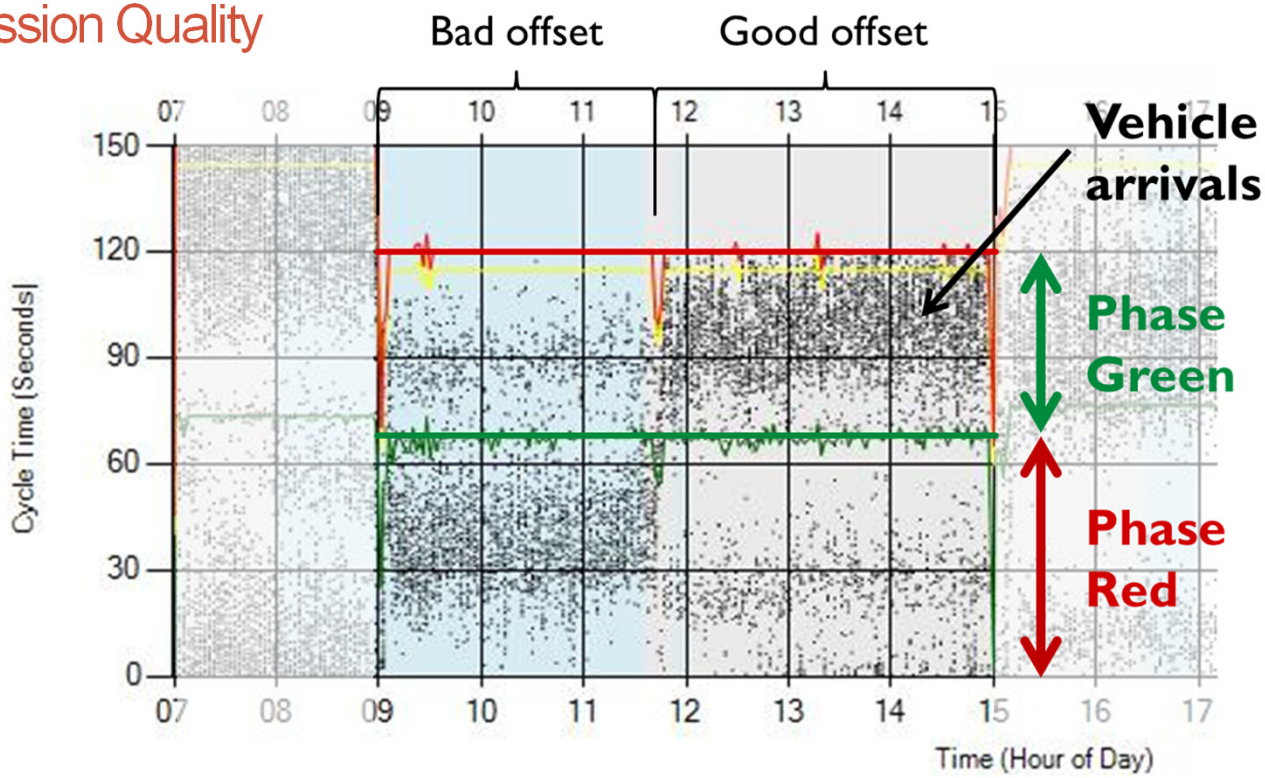
Coordination Optimization Example:

Progression Quality

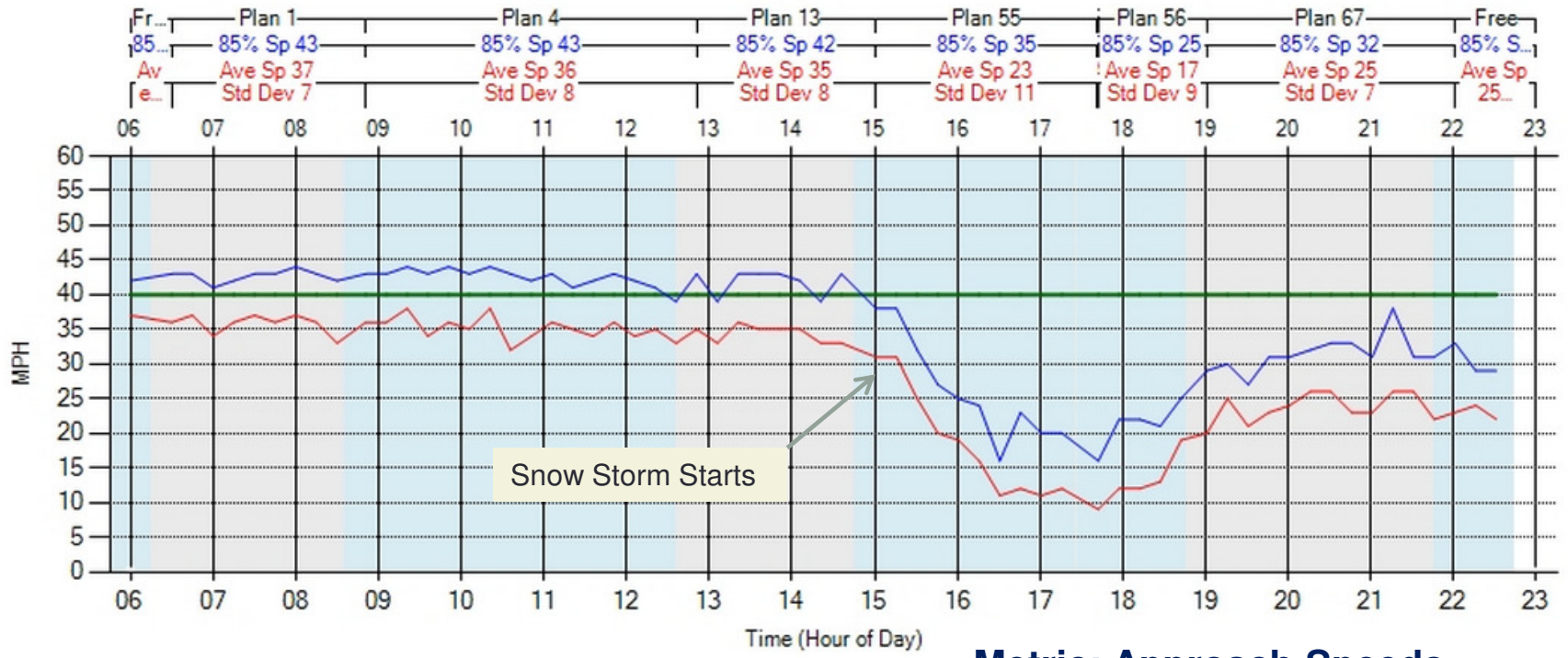


Metric: Purdue Coordination Diagram

Detection Requirements: Advance Counters

Operations & Traffic Study Example:

Vehicle Speeds at Intersections



Metric: Approach Speeds

Detection Requirements: Advance Radar